UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northwest and Alaska Fisheries Center
Resource Assessment and Conservation Engineering
2725 Montlake Boulevard East
Seattle, WA 98112

May 8, 1981

CRUISE RESULTS

NOAA R/V MILLER FREEMAN
Leg I
Cruise No. MF-81-01

Northwest and Alaska Fisheries Center-International Pacific Halibut Commission
Cooperative Demersal Trawl Survey

Cruise Period: February 2-27, 1981

Itinerary

The NOAA ship MILLER FREEMAN departed the Pacific Marine Center on February 2 and returned to Kodiak on February 27 upon the completion of the time allocated for the 1981 cooperative Northwest and Alaska Fisheries Center-International Pacific Halibut Commission (NWAFC-IPHC) demersal trawl survey. One intervening port call was made in Kodiak on February 7 to off-load equipment and to embark scientific personnel.

Area Surveyed

The survey area was restricted to the slope and shelf region between Unimak Pass and the Pribilof Islands in the southeastern Bering Sea.

Primary Objectives

This survey was conducted to:

1. Determine the incidental catch rates of Pacific halibut in demersal trawl hauls; and

2. Examine the distribution and abundance of crab/groundfish resources in the study region during midwinter.

Secondary Objectives

Other objectives were to:

1. Tag Pacific halibut;

2. Collect biological data on selected species of fish and crab;

3. Conduct a series of comparative trawling operations with the 83/112 (with and without roller gear) to determine relative catchability coefficients by gear type;

4. Collect tissue samples from Pacific halibut for electrophoretic analyses;

5. Collect and preserve various species of fish and crab for subsequent laboratory identification and analyses;

6. Obtain water temperature profiles using XBT's.

Gear

The 83/112 otter trawl was the standard sampling gear used with a 112 ft footrope and 83 ft headrope. Mesh sizes in the wings and body were 4 inches and 3.5 inches in the intermediate and codend. There was no codend liner. Thirty-one 8-inch and three 10-inch floats were attached to the headrope. Six ft by nine ft steel v-doors with-25 fathom dandylines (25 fathom single and 15 fathom double) were used.

Methods

The survey sampling pattern was designed to comprehensively evaluate the distribution and abundance of fish and crab stocks over the continental shelf and slope region (Figure 1). The standard NWAFC 20 x 20 nautical mile grid sampling system (one primary station per 400 square miles) was used over the study area. Additional IPHC primary stations and NWAFC secondary stations were established to provide more intensive area coverage.

Catches were processed entirely at all stations if they were less than approximately 2500 pounds (1100 kg), or in the case of larger catches, subsampling techniques were used to reduce the processed portion to 2500 pounds or less. However, all Pacific halibut were removed from the catch regardless of catch size. Pacific halibut were measured as unsexed, tagged as time permitted, and released.

All groundfish were sorted by species with weights and, in most cases, numbers of each species determined. For commercially important species, length-frequency data were taken from each haul. King and Tanner crabs were sorted by species and sex. Weights and numbers in each species-sex category were determined. Lengths, widths, shell condition, egg condition, and fullness of egg clutch were also determined from all crabs in the catch or from a random subsample of the total catch.

An important objective of the survey was to compare incidence of halibut in trawl catches when the trawl was fished with and without roller gear. The standard gear for the survey was the 83/112 trawl without roller gear. For the comparative fishing experiments when relatively large catches of halibut were taken in a standard tow, the station was fished again with the 83/112 trawl rigged with roller gear. Stations on the shelf and slope were both fished in this manner.

Results

A total of 68 demersal trawl hauls was attempted in the survey area. This included 6 comparative tows utilizing roller gear, 6 opportunistic sets made near Unimak Pass, and 8 unsuccessful trawl hauls. Additionally, one test tow was conducted at the beginning of the survey to evaluate the gear proficiency and one qualitative mid-water tow was completed to sample heavy pelagic fish sign. A total of 48 scheduled stations was successfully occupied. Because it soon became apparent that there was no difference in catches of halibut with and without roller gear and because of time restrictions, the comparative experiments were discontinued after 6 comparative tows had been completed.

A total of 20,939 length measurements by sex/cm group was collected from the major fish species encountered (Table 1). Shell size and condition and clutch condition were recorded for 8 crab species. Tanner crabs were also examined for the presence of "blackmat disease" and chela height and merus length were taken from Korean horsehair crabs.

A total of 237 Pacific halibut was tagged and released for subsequent movements and recapture studies. Tissue and organ samples were retained from 60 halibut for electrophoretic analyses. Individual weights, lengths by sex, maturity, and otoliths were collected from 186 sablefish specimens. Approximately 60 specimens of arrowtooth flounder and Kamchatka flounder were preserved for later taxonomical evaluation. Various species of Sebastes, Zoarcidae, and Coryphaenoides were also preserved for later identification.

The gadids, Pacific cod, and walleye pollock were the most abundantly observed species with overall CPUE's of 86.7 and 54.8 kg/ha, respectively (Table 2). Both species were observed in greatest concentrations near Unimak Pass and along the shelf edge (Figures 2 and 3). Pacific cod size composition increased substantially by depth, averaging 39 cm on the shelf and 57 cm at water depths greater than 100 fathoms on the slope. Arrowtooth flounder (22.6 kg/ha overall) and Pacific halibut (10.0 kg/ha overall) were the most commonly encountered Pleuronectid species (Figures 4 and 5). CPUE for arrowtooth flounder increased about 10-fold from 5.5 kg/ha trawled on the shelf to 58.6 kg/ha trawled on the slope. The average lengths of halibut were approximately 44 cm on the shelf and 60 cm on the slope with an overall average of 48 cm.

Scientific Personnel

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Table 1.--Length measurements taken during the 1981 cooperative NWAFC-IPHC demersal trawl survey in the eastern Bering Sea.

Species	Number measured
Pacific cod (*Gadus macrocephalus*)	4,142
Walleye pollock (*Theragra chalcogramma*)	4,292
Flathead sole (*Hippoglossoides elassodon*)	3,239
Arrowtooth flounder (*Atheresthes stomias*)	2,882
Pacific halibut (*Hippoglossus stenolepis*)	2,302
Rock sole (*Lepidopsetta bilineata*)	1,646
Yellowfin sole (*Limanda aspera*)	1,491
Sablefish (*Anoplopoma fimbria*)	423
Atka mackerel (*Pleurogrammus monopterygius*)	186
Greenland turbot (*Reinhardtius hippoglossoides*)	159
Kamchatka flounder (*Atheresthes evermanni*)	91
Pacific ocean perch (*Sebastes alutus*)	73
Northern rockfish (*Sebastes polyspinus*)	13
Total measured fish	20,939
Red king crab (*Paralithodes camtschatica*)	22
Blue king crab (*Paralithodes platypus*)	10
Golden king crab (*Lithodes aequispina*)	10
Tanner crab (*Chionocetes bairdi*)	1,592
Tanner crab (*C. opillo*)	564
Tanner crab (*C. hybrid*)	96
Tanner crab (*C. tanneri*)	1
Korean horsehair crab (*Erimacrus isenbeckii*)	59
Total crab measured	2,354

Table 2.--Rank by CPUE (kg/ha) of fish and invertebrate species encountered during the 1981 cooperative NWAFC-IPHC trawl survey in the eastern Bering Sea.

Rank/Taxon	All areas combined			Subarea 1[1/]			Subarea 2[1/]		
	kg/ha	Mean size (cm)	Mean wt (lb)	kg/ha	Mean size (cm)	Mean wt (lb)	kg/ha	Mean size (cm)	Mean wt (lb)
1. Pacific cod	86.7	40.4	1.98	98.1	38.7	1.68	62.7	56.8	4.73
2. Walleye pollock	54.8	47.3	1.75	39.3	46.7	1.70	87.7	47.9	1.81
3. Arrowtooth flounder	22.6	43.0	1.49	5.5	36.9	1.06	58.6	44.8	1.63
4. Atka mackeral	13.7			20.1			[3/]		
5. Pacific halibut	10.0	48.2	3.42	8.1	44.4	2.46	14.2	60.1	6.42
6. Yellowfin sole	6.9	27.5	0.48	10.2	27.5	0.48	0	-	-
7. Sablefish	6.8			0.2			20.7		
8. Rock sole	6.6			0.7			[3/]		
9. Flathead sole	6.1	29.2	0.61	5.8	27.8	0.49	6.7	34.4	1.05
10. Yellow Irish lord	5.5			6.7			2.8		
11. Basketstarfish	4.1			6.1			0		
12. Starry skate	3.3			3.4			3.1		
13. Greenland turbot	2.1	64.8	4.85	0.1	-	1.84	6.3	64.8	5.20
14. Tanner crab (C. bairdi)	1.9			2.2			1.4		
15. Tanner crab (C. opilio)	1.9			2.8			[3/]		
16. Skate species	1.4			1.4			1.5		
17. Octopus	1.1			1.1			1.2		
18. Bigmouth sculpin	1.0			0.5			2.3		
19. Gymnocanthus species	0.8			1.1			0		
20. Snail	0.6			0.8			0.4		

1/ Shelf area, depths less than 100 fm, total effort 178.8 ha
2/ Slope area, depths greater than or equal to 100 fm, total effort 66.2 ha
3/ CPUE less than 0.005 kg/ha trawled

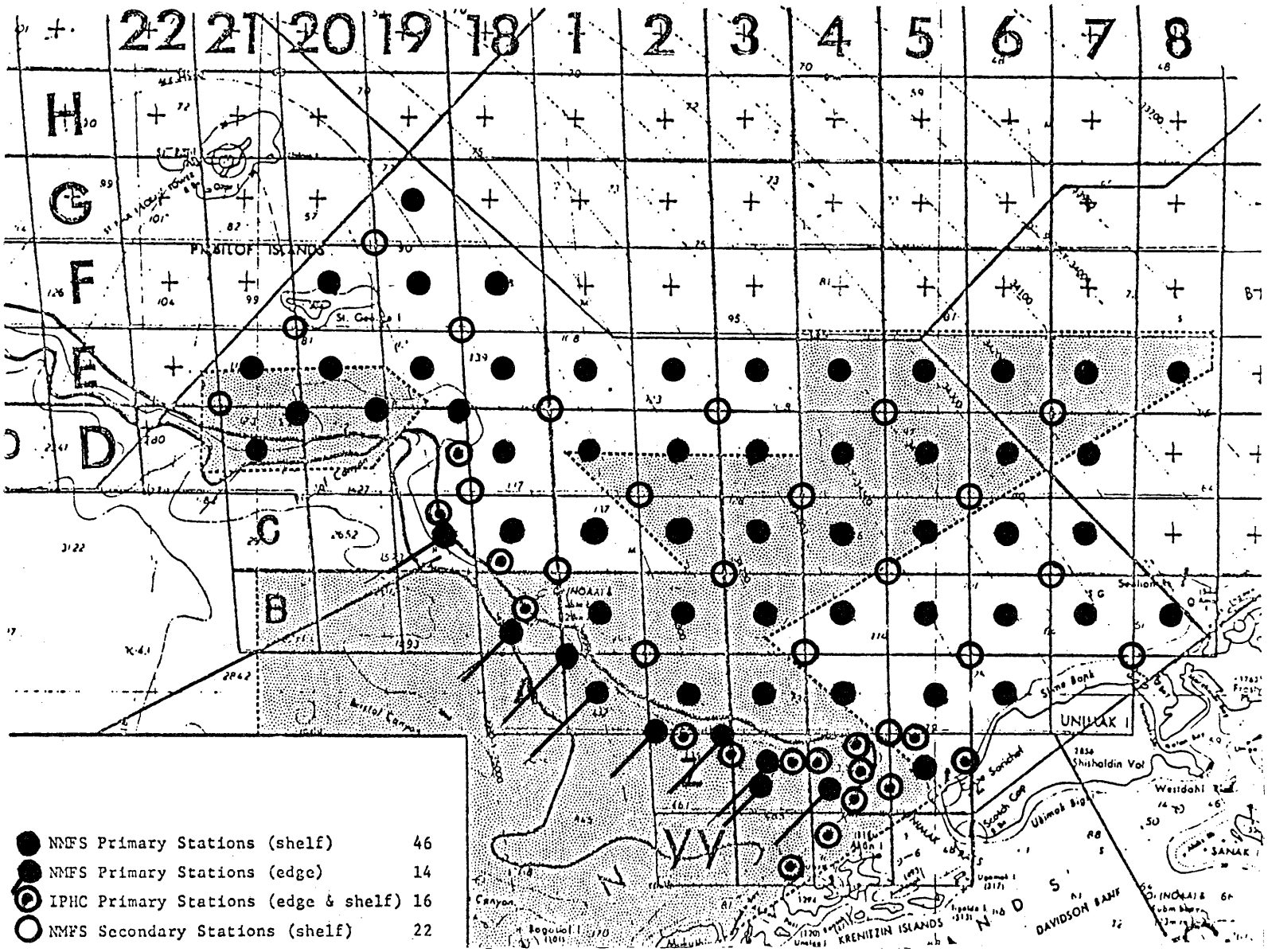


Figure 1.--Planned station pattern for the NWAFC-IPHC cooperative survey, February, 1981.

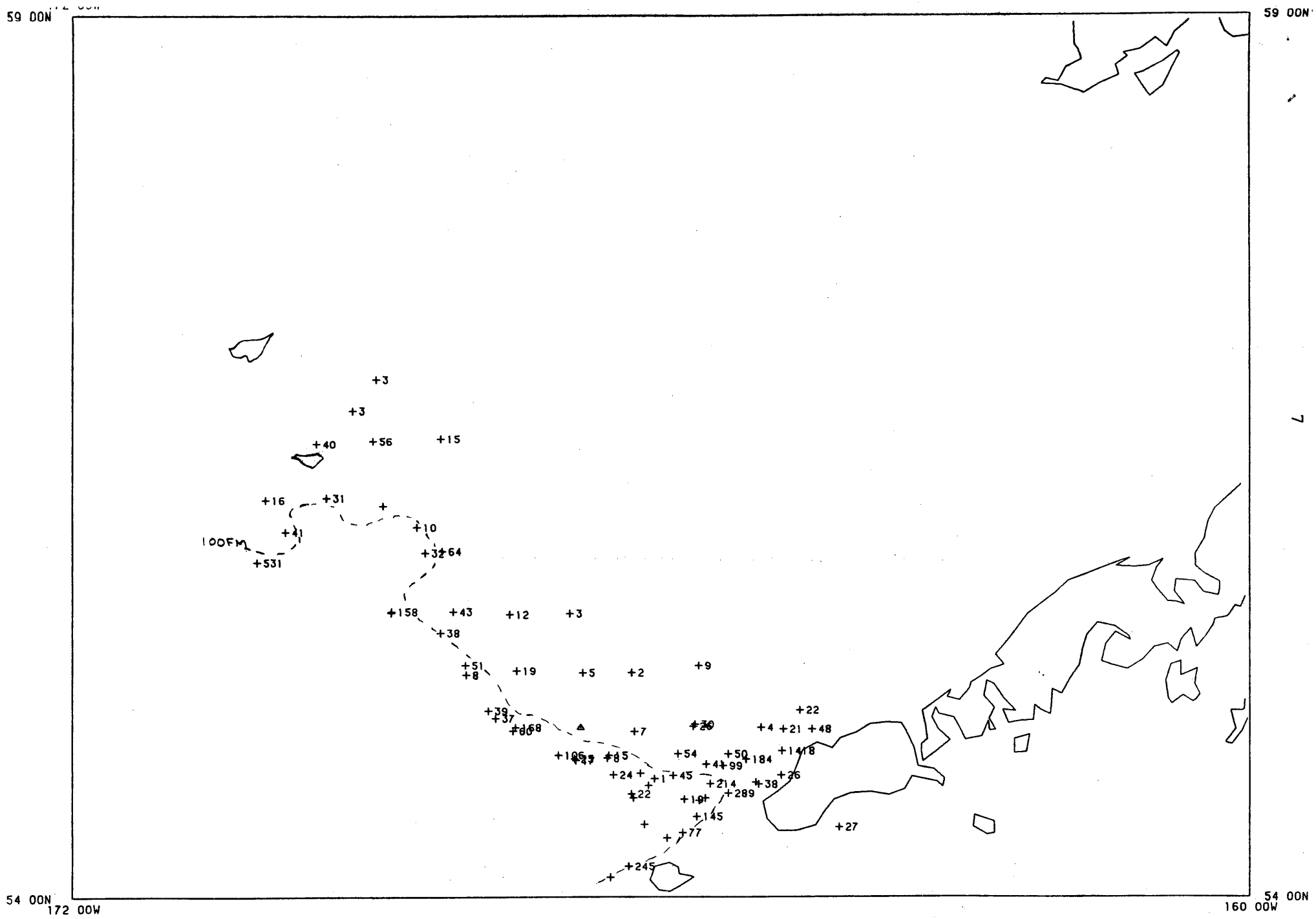
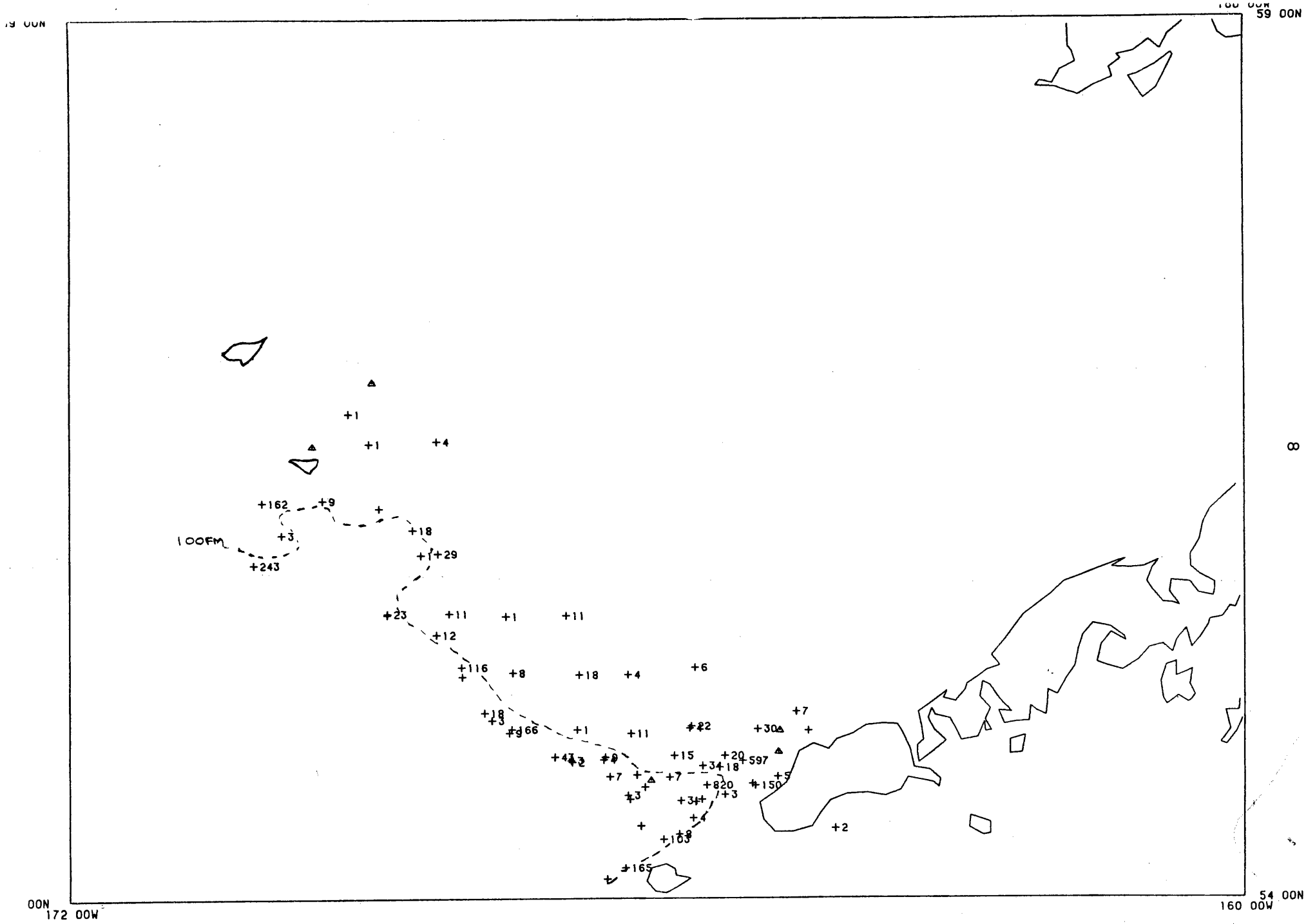


Figure 2.--Distribution and relative abundance by weight (kg/ha) of Pacific cod during the 1981 cooperative NWAFC-IPHC trawl survey in the eastern Bering Sea.



jure 3.--Distribution and relative abundance by ght (kg/ha) of walleye pollock during the 1981 cooperative NWAFC-IPHC trawl survey in the eastern Bering Sea.

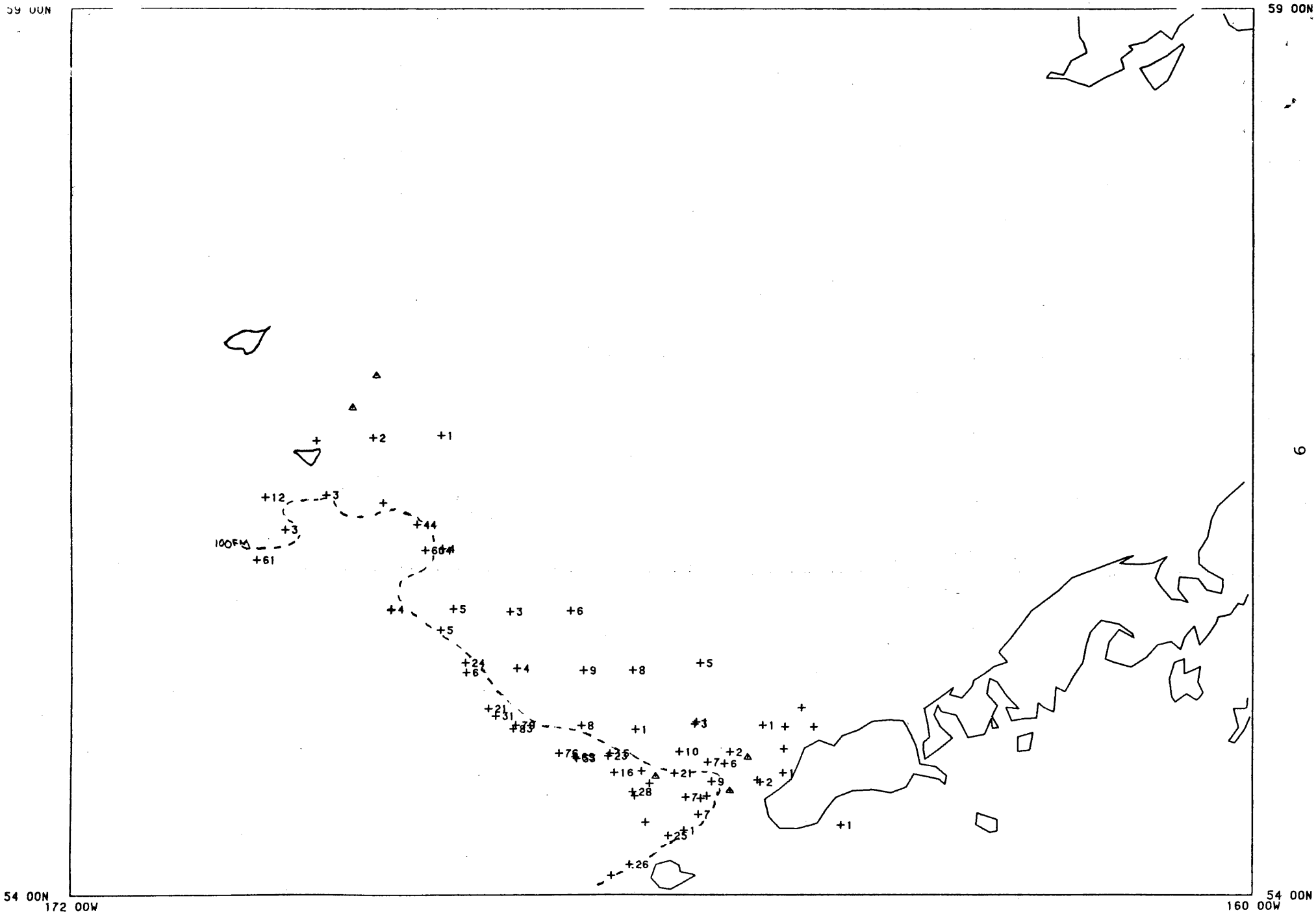


Figure 4.--Distribution and relative abundance by weight (kg/ha) of arrowtooth flounder during the 1981 cooperative NWAFC-IPHC trawl survey in the eastern Bering Sea.

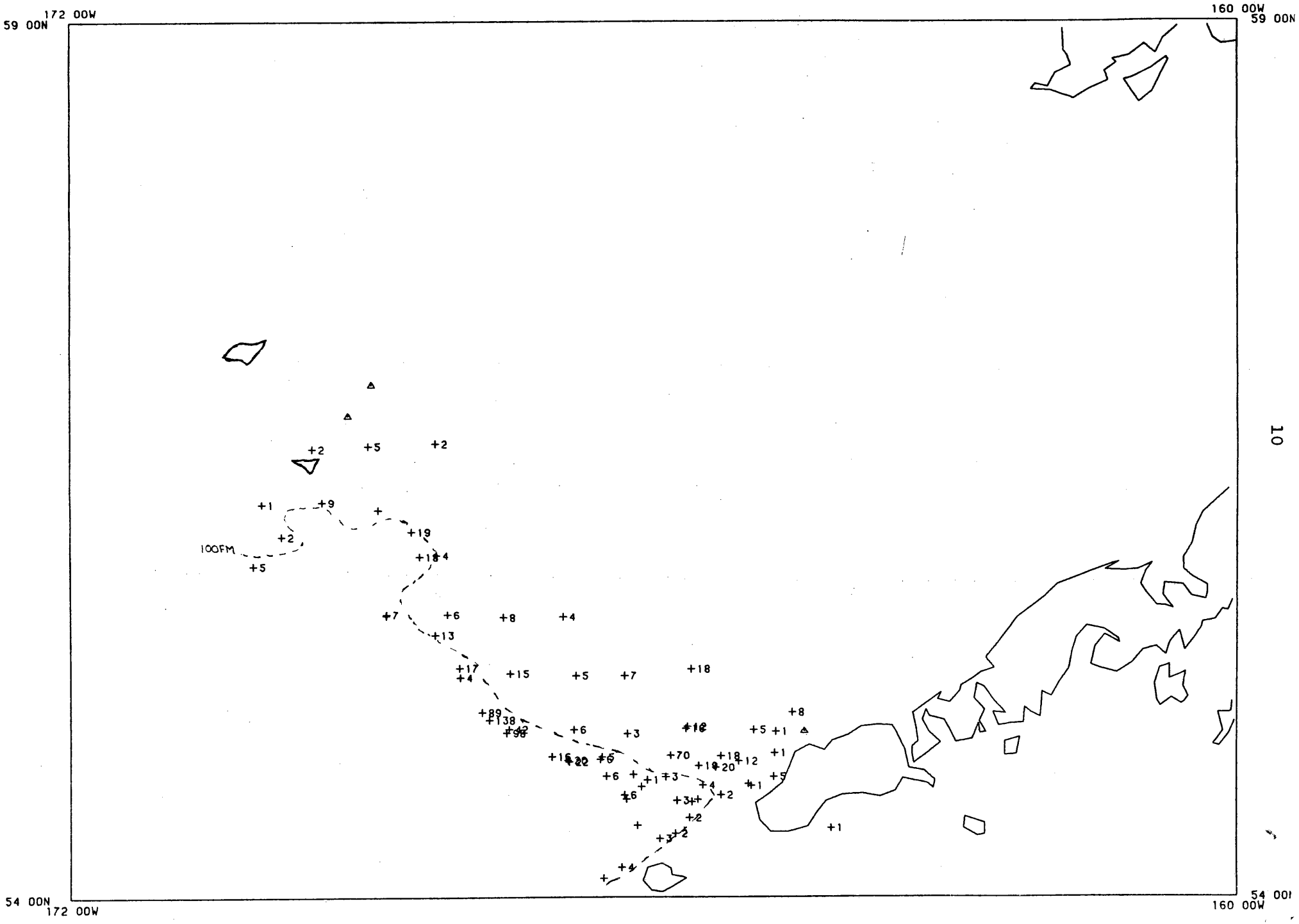


Figure 5.--Distribution and relative abundance by weight (kg/ha) of Pacific halibut during the 1981 cooperative NWAFC-IPHC trawl survey in the eastern Bering Sea.